THE BELL SYSTEM
TECHNICAL JOURNAL

DEVOTED TO THE SCIENTIFIC AND ENGINEERING
ASPECTS OF COMPUTING

Volume 62 | January 1983 | Number 1, Part 2

The 3B20D Processor & DMERT Operating System:

Prologue

By J. M. SCANLON

(Manuscript received June 23, 1982)

The 3B20 Duplex Processor (3B20D) and its DMERT operating system represents a new and very important building block for the Bell System's stored program network. The first system to cut over was the network control point application in Kansas City, Missouri, on September 3, 1981. By year end 1982, the common 3B20D/DMERT processor system will have been in service supporting six different telecommunication applications across 65 different sites in 17 of the 20 Bell Operating Companies, including the Long Lines Division of AT&T. By year-end 1983, the number of different applications is expected to grow to ten and the number of sites to 300, covering all Bell Operating Companies. This very rapid buildup from first introduction to substantial deployment throughout the Bell System establishes the 3B20D/DMERT processor as a key element for the continued evolution of the Bell System's stored program network.[1]

The 3B20D Processor had its origins in exploratory work, begun in 1976, to establish a successor to the 3A processor[2] deployed with No. 2B ESS and No. 3 ESS.[3] At that time, a specialized replacement processor for 3A was envisioned, which is the origin of the designation "3B." At about the same time, research in operating systems charac-

terized by the *UNIX** operating system[4] and MERT[5], and portable higher-level languages characterized by C,[6] had matured to the point that the use of these techniques in real-time telecommunications applications became feasible and highly desirable. In addition, it was becoming clear that processor capabilities to support the future needs of the stored program network would have to be significantly enhanced beyond the capabilities of then-deployed ESS processors. These enhancements were required to support what was foreseen as the broadening role of the ESS processor from primarily a highly reliable call-handling and switch-maintenance controller to a sophisticated data base manager and terminal/data link controller as well. The use of a common processor and operating system throughout the telecommunications network also was seen as providing significant economic benefits occurring both from manufacturing and operational standardization, and most importantly, from achieving a high degree of software standardization. By early 1978, these factors had crystallized into five major development goals to:

(*i*) Provide the high degree of reliability and fault tolerance traditionally expected of ESS processors.

(*ii*) Provide efficient support of the high-level language, C, and a new real-time operating system, DMERT.

(*iii*) Provide the ability to directly execute programs written for earlier ESS processors, permitting these ESSs to follow a low-cost migration path to new processor and software technology.

(*iv*) Provide hardware and software architectural features to efficiently support large real-time data base and extensive data link capabilities.

(*v*) Provide a highly efficient software-development system based on the *UNIX* operating system as an integrated capability of the processor.

These goals were met successfully by a development program that designed the processor, 3B20D, and the operating system, DMERT, in parallel. The design approach used to bring the processor and operating system into fruition are discussed in the papers included in this issue.

The issue begins with a paper that discusses the first four applications of the 3B20D/DMERT system, followed by an overview and a discussion of the architecture of the complete system. There are then 15 other papers, grouped in sequence along the major topics of hardware (5 papers), software (4), maintenance and craft interface (5), and, finally, system integration and test (1). While omitting design-level details, this collection of papers provides a comprehensive overview of the 3B20D Processor and DMERT Operating System.

* Trademark of Bell Laboratories.

It is impossible to adequately acknowledge the contributions of everyone involved in a project of the magnitude of 3B20D/DMERT—people from many organizations of Bell Laboratories, Western Electric, AT&T, Long Lines, and the operating telephone companies, all participated in important ways. The authors of this volume would like to express their gratitude to all of these people for the unity of purpose and free communication that overcame the complex organizational interfaces and technical problems, and permitted successful project completion.

REFERENCES

1. *Stored Program Controlled Network,* B.S.T.J., *61,* No. 7 (September 1982).
2. W. N. Toy, "Fault Tolerant Design of ESS Processors," Proc. IEEE, *66* (October 1978), pp. 1126–45.
3. E. A. Irland and U. K. Stagg, "New Developments in Suburban and Rural ESS (No. 2 and No. 3 ESS)," 1974 ISS Symposium Record, pp 512/1–6.
4. D. M. Ritchie and K. Thompson, "The *UNIX* Time-Sharing System," B.S.T.J., *57* (July–August 1978), pp. 1905–29.
5. H. Lycklama and D. L. Bayer, "The MERT Operating System," B.S.T.J., *57* (July–August 1978), pp. 2049–86.
6. D. M. Ritchie, S. C. Johnson, M. E. Lesk, and B. W. Kernighan, "The C Programming Language," B.S.T.J., *57* (July–August 1978), pp. 1991–2019.